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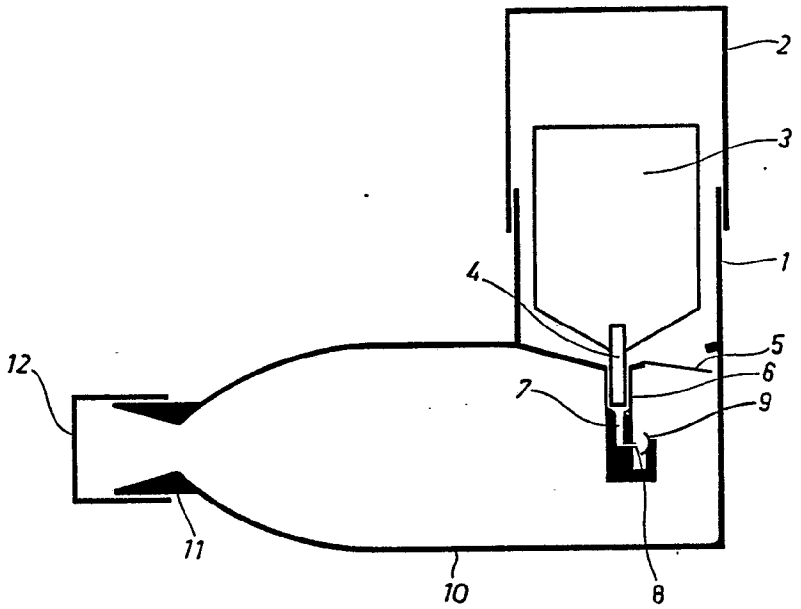

(57) Abstract

An inhalation device, comprising a socket (1) intended for an aerosol container (3) of a substance to be inhaled, the bottom of said socket being fitted with a baffle (6), which receives a valve stem (4) fixed to container (3) and penetrates into an inhalation chamber (10) provided with a mouthpiece (11), a nozzle at the end of an inlet duct (7) terminating in said inhalation chamber (10). Mounted at a distance from said nozzle (8) of inlet duct (7), the nozzle being directed towards the end of inhalation chamber (10) far from mouthpiece (11), is an opposing baffle plate (9) for pulverizing a spray of medicament in inhalation chamber (10), and that said inhalation chamber (10) is provided with a one-way valve (5) for passing air into chamber (10).

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Inhalation device

The present invention relates to an inhalation device provided with a socket for an aerosol container that contains material to be inhaled, the bottom of said socket being fitted with a baffle which receives the valve stem of said container and extends into an inhalation chamber provided with a mouthpiece, a nozzle being mounted on the end of an inlet channel and terminating in said inhalation chamber.

At present, medicine is inhaled into the lungs by using either an inhalation aerosol or a powder metering device. A major drawback in inhalation aerosol is that the dosing must be effected in the beginning of inhalation, which all patients cannot manage. Another minor drawback is also that aerosol does not work at temperatures below zero due to the relatively low vapour pressure of generally used propellant compositions.

Powder metering devices do not suffer from the above drawbacks but, due to small amounts of medicine, they require the use of a carrier, at present lactose or glucose. These are hygroscopic carbohydrates which readily adhere to a moist surface. A powder metering device gets wet on the inside if exhaled through it or brought from cold weather to warm indoor air. A consequence is soiling of the device and diminishing of the inhaled dosage. An inexact dosage may also result if an inhalation-ready device is held in a wrong position with some of the powder falling out through the inhalation hole. From a user's point of view, filling of a powder metering device with a medical formulation is inconvenient for each dosage.

Lactose and glucose are useful for the mouth pathogenes and there is no doubt that decay of the teeth would increase because of the continuous exposure to sugar caused by the powder. Also for patients over-sensitive to lactose, such medical formulation is not always suitable.

An object of the invention is to provide an inhalation device whereby all the above drawbacks are eliminated, i.e. a device that is simple to operate and provides effective inhalation of a substance to be inhaled with procedures as simple as possible.

The above object of the invention is fulfilled with a device is characterized in that mounted at a distance from the inlet nozzle, directed towards the opposite end of the inhalation chamber mouthpiece, is an opposing baffle plate for pulverizing a medicine spray in the inhalation chamber and that said inhalation chamber is provided with a one-way valve for passing air into the chamber.

Thus, the above device comprises a combination of an aerosol spray and a powder inhalation device. In the device, the dosage of a medical formulation proceeds from an aerosol container, which is highly preferable and simple from the point of view of a user but still the inhalation of a powder proceeds according to the user's own inhaling. After all, this type of inhalation has been found more effective than an aerosol spray directly into the mouth.

The air needed for inhalation is passed into the inhalation chamber through a one-way valve, preferably mounted on the wall between socket and inhalation chamber. In such position, a one-way valve receives best possible

protection below the aerosol container. Also, the socket is usually fitted with a protective cover.

For best possible spray atomization, said baffle plate is concave with respect to the nozzle. Thus, the spray atomizes effectively and spreads all over the chamber.

The invention will now be described in more detail with reference made to the accompanying drawings, in which

fig. 1 shows one embodiment of a device of the invention and

figs. 2 - 3 show different modifications of such device.

A device shown in fig. 1 comprises a tubular body for building an inhalation chamber 10 with an upright socket 1 at one end. This socket 1 is intended for an aerosol container 3 of a medical formulation. The bottom of said socket is fitted with a baffle member 6 provided with a channel whose inlet is sufficiently wide to receive a valve stem 4 fixed to an aerosol container 3 inserted therein. Thus, the reduced part of said channel provides a baffle member against valve stem 4. The channel continues as a narrow duct 7 lengthwise of said baffle member 6. The end of this duct 7 is provided with a cross-channel, extending crosswise with respect to the longitudinal direction of said duct and terminating in a nozzle member 8.

Spaced from and opposite to this nozzle 8 is mounted a baffle plate 9 whose surface is concave with respect to nozzle 8.

A socket 1 for receiving an aerosol container 3 is open and provided with a protective cap 2 for cover-

ing said aerosol container 3.

The wall between inhalation chamber 10, formed by the body, and said socket 1 is provided with a one-way valve 5 which only opens towards the inhalation chamber so as to facilitate the passage of air into the inhalation chamber. An air-flow in the opposite direction closes said valve 5.

The inhalation chamber is an elongated tubular body, whose end far from socket 1 is fitted with a mouthpiece 11 to be positioned in or in front of the mouth of a user and coverable with a protective cap 12.

The device is operated as follows. An aerosol container 3 filled with a medical formulation is positioned in socket 1 and valve stem 4 of the container is pushed down to the bottom of a channel in baffle member 6. Pressing said aerosol container 3 still further down serves to open a metering valve and a certain amount of gas and medicament suspension discharges into duct 7 and out of its nozzle 8 rushing towards baffle plate 9. This deflects the gasifiable mixture into the inhalation chamber, the gasification beginning in the rear section of inhalation chamber 10 and the expanding gas drives the air in front of it towards said mouthpiece. During the expansion period, said one-way valve 5 prevents the discharge of gas this way from chamber 10. A released amount of gas is such that, at normal pressure, it only fills a part of the inhalation chamber. Medicament particles form a mixture together with gas. When a user positiones the open mouthpiece 11 in his or her mouth and inhales, said one-way valve 5 opens and air flows therethrough into inhalation chamber 10. The flowing air picks up the powdered medicament in the chamber carrying it into the lungs of a user.

As a result of the operating principle, the propellant pressure and the size of a nozzle orifice are not critical in a device of the invention the same way as in a normal aerosol device. By increasing gas pressure, the device will be operable at temperatures below zero. The diameter of a nozzle orifice determines the time of gasification in a manner that as much medicament as possible can be inhaled.

As shown in the figure, the device is provided with a container protection cap 2 for protecting the device and especially said aerosol container 3 during transport. In addition, mouthpiece 11 is closed by means of a protective cap 12 making the device totally sealed and covered during transpoort with no impurities penetrating therein.

Figs. 2 - 4 illustrate various embodiments of the device shown in fig. 1. The equipment shown in these figures 2 - 4 includes the same components as fig. 1, so the embodiments shown in these figures are not described in detail with the basic design the same as in fig. 1.

In the embodiment shown in fig. 2, a concave baffle plate is mounted on the end wall of inhalation chamber 10. Thus, the end wall can be provided with such a separate component or the end wall itself can be designed as a concave baffle plate 9, as shown in fig. 3. In the case depicted in fig. 3, said socket 1, together with its baffle 6, for said aerosol container 3 is positioned in the midsection of inhalation chamber, the distance between nozzle 8 and baffle plate 9 being relatively long. A one-way valve 5 is mounted adjacent to baffle plate or surface 9.

In the embodiment shown in fig. 4, said socket 1 for

aerosol container 3 is positioned in the forward end of a device, adjacent to mouthpiece 11 of inhalation chamber 10. Chamber 10 is designed to have a tubular shape and its end far from mouthpiece 11 is rounded. This end is provided with a hole with a shut-off member inserted therein. This shut-off member 13 comprises a component penetrating into inhalation chamber 10 and having a concave surface to provide a baffle plate of the invention. Baffle plate 9 is dimensioned so as to totally cover said hole in the bottom of inhalation chamber 10. During the spraying action, a spray of medicament discharges from nozzle 8 rearwards and towards the baffle plate, urging the latter against the hole and shutting off said chamber 10. During the inhaling, said shut-off member 13 can be pressed inwards in the hole, whereby the stopper lugs outside said shut-off member prevent the member from penetrating completely into the inhalation chamber. At the same time, however, replacement air is allowed to pass through the hole into the inhalation chamber. Thus, said shut-off member 13 operates as a one-way valve.

Claims

1. An inhalation device, comprising a socket (1) for an aerosol container (3) containing a substance to be inhaled, the bottom of said socket being provided with a baffle (6) for receiving a valve stem (4) fixed to said container (3), said baffle penetrating into an inhalation chamber (10) fitted with a mouthpiece (11), a nozzle at the end of an inlet duct (7) terminating in said inhalation chamber (10), c h a r a c t e r i z e d in that mounted at a distance from the nozzle (8) of inlet duct (7), said nozzle being directed towards the end of inhalation chamber (10) far from mouthpiece (11), is an opposing baffle plate (9) for pulverizing a spray of medicament in inhalation chamber (10), and that said inhalation chamber (10) is provided with a one-way valve (5) for passing air into chamber (10).

2. A device as set forth in claim 1, c h a r a c t e r - i z e d in that said one-way valve (5) is mounted on a wall between socket (1) and inhalation chamber (10).

3. A device as set forth in claim 1 or 2, c h a r a c t e r i z e d in that said baffle plate (9) is concave with respect to nozzle (8).

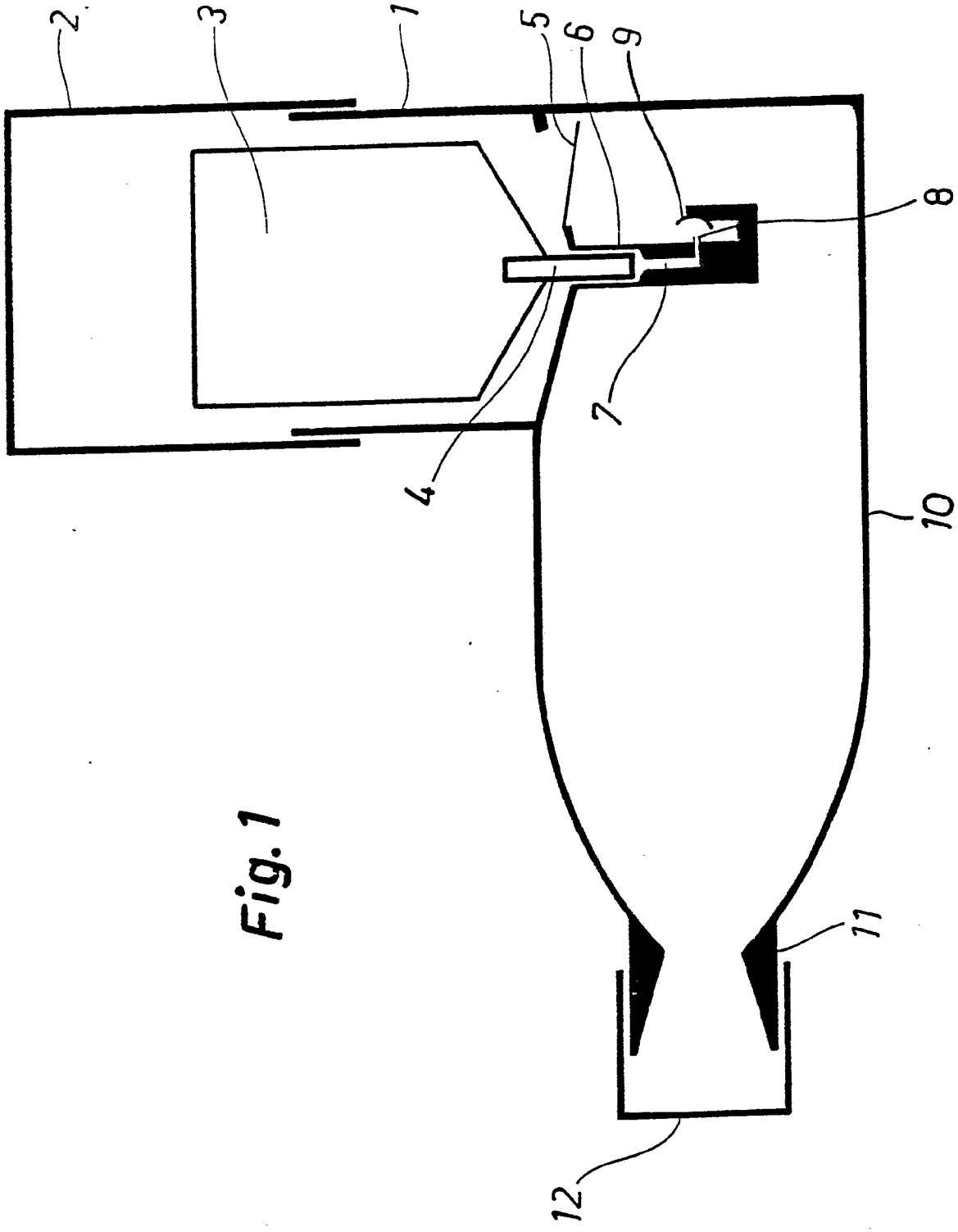

Fig. 1

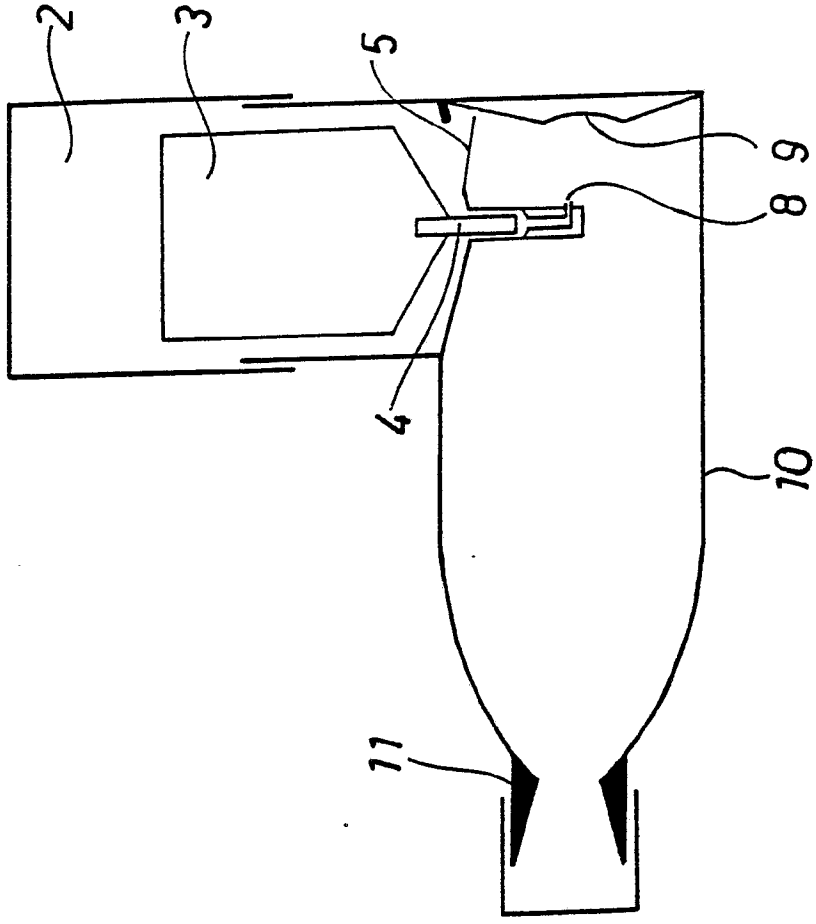

Fig. 2

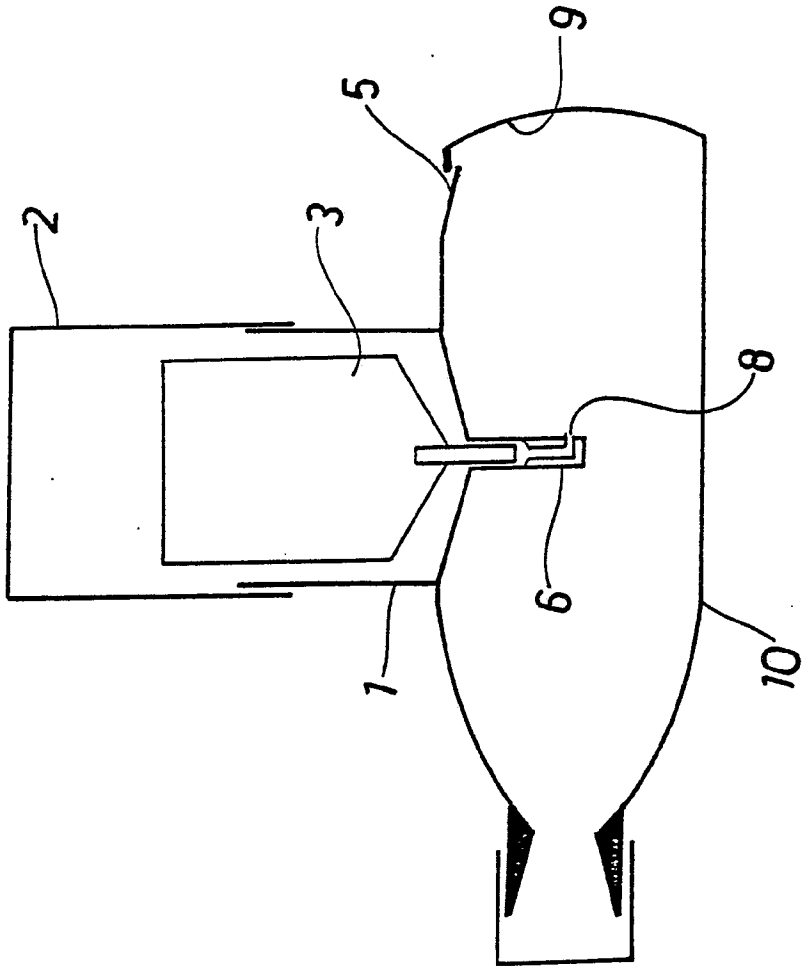

Fig. 3

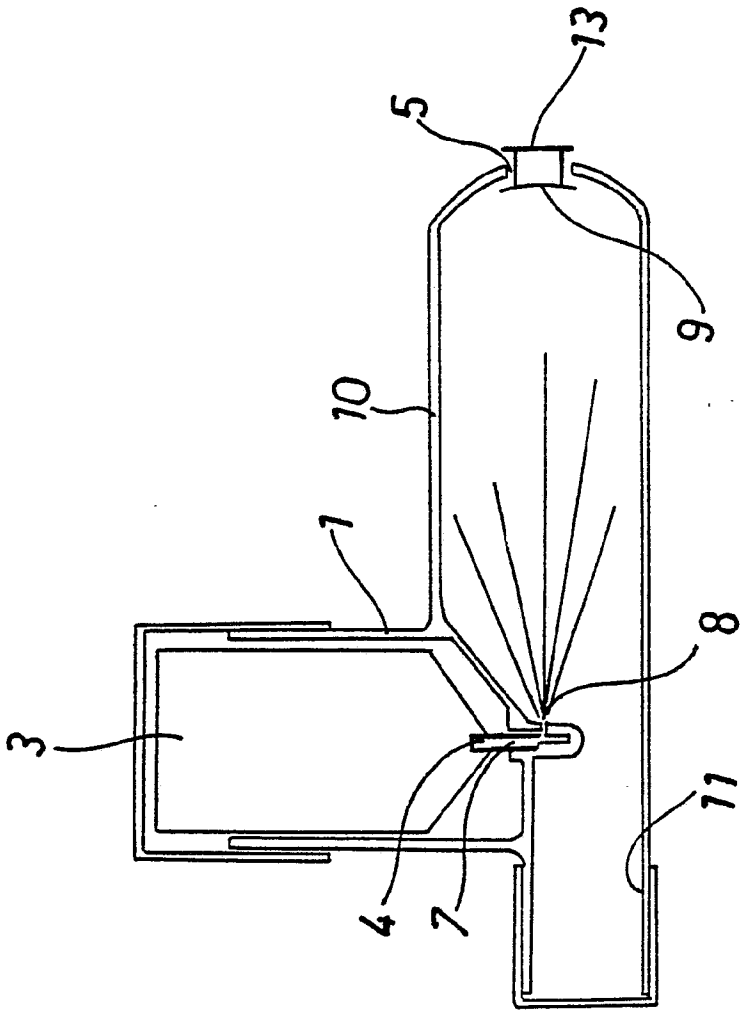

Fig.4

INTERNATIONAL SEARCH REPORT

International Application No PCT/FI84/00100

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

A 61 M 15/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC	A 61 M 11/00-08, 15/00-02
US Cl	128:173, 185, 200, 201

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	SE, B, 7103839-2 (L.W BIRCH ET AL) 23 February 1976	1, 3
A	SE, B, 7901417-1 (R.G. MONÖ ET AL) 17 November 1980	1, 3
A	NO, B, 134 730 (W.E. WARREN) 30 August 1976 (22, fig 2-3)	1, 3
Y	DE, B, 1 046 264 (G.J. BUSCH) 11 December 1958	1, 3
Y	US, A, 3 838 686 (G. SZEKELY) 1 October 1974	1 – 3

* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
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International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Leif Karnsäter

L.E.